would of course be shared by this with any other lunar method. The times I noted were,

	h	m	s	
Totality commenced	6	28	13	G.M.T.
Totality ended	8	3	15	

The colour seen upon the Moon on this occasion, and especially the remarkable bluish hue which spread over the lunar regions preceding the reappearance of the sunlight, could not fail strongly to impress upon the mind the wish to realise in imagination the effect that would be seen from the Moon of the prismatic colours surrounding our planet, with the Sun's corona in the background and with *Venus* not far distant.

Total Eclipse of the Moon, February 27, 1877. By the Rev. S. J. Perry.

The night was cloudless, but there was a sharp frost, which made the air unsteady. The Moon rose partially eclipsed. Using a power of about 100 with an 8-inch achromatic, the following contacts were observed :—

	h	m	s	
Commencement of Totality	6	27	24·5	G.M.T.
End of Totality	8	4	8·5	
Last contact with Shadow	9	0	6·0	

The time was taken with a Frodsham chronometer, compared during the eclipse with the standard sidereal clock; and clock stars were observed.

The darkness of that portion of the penumbra which was in close proximity to the umbra was so great, that the last contact was difficult to observe.

Several reappearances of occulted stars were seen during totality, and might have been well observed.

The thin circle of light on the Moon's limb was in such striking contrast with the cloudy dull brick-red shading of the centre, that to many persons it seemed as if the Moon was not completely immersed in the Earth's shadow.

Stonyhurst Observatory,
1877, *February* 28.

On Kepler's Problem. By M. A. de Gasparis.

(*Translation.*)

The numerical solution of the equation $M = E - e'' \sin E$ may be useful, especially for the new planets, for comets of elliptic orbit, and for the satellites of double stars, the number of which

is always increasing. I here reproduce a solution, very much simplified, which, proceeding by direct operations, gives to within a few seconds the value of E.

I assume $E = M + n . 10°$, and we then have by substitution

$$n \frac{(10°)''}{R''} = e \sin (M + n . 10°), \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

or, if we please,

$$10n \frac{(1°)''}{R''} = e \sin (M + 10n . 1°) \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

The unknown quantity is here n, and we know that its integer part is less than 6. For a first step I employ logarithms to three places of decimals, for the second step to five places. Moreover $\log \frac{(10°)''}{R''} = 9.2418774$, and therefore $\log \frac{(1°)''}{R''} = 8.2418774$ This being so,

1° I write in a line the logarithms of 1, 2, 3, 4, 5, 6.

2° Below these the logarithm of $\frac{(10°)''}{R''}$, and I take the sums.

This operation is common to all the examples which present themselves.

3° On another line, respectively below the preceding numbers, I write (six times) $\log e$.

4° Below the $\log e$'s, I write the $\log \sin (M + 1 . 10°)$, $\log \sin (M + 2 . 10°) . . . \log \sin (M + 6 . 10°)$; and I take the sums.

We have at sight the limits of the integer part of n, and the tenths are obtained by a simple proportion.

Suppose, for example, $M = 27° \ 15' \ 7''.42$, $\log e = 9.9231544$, we proceed as follows:—

	1	2	3	4	5	6
$\log n$	0.000	0.301	0.477	0.602	0.699	0.778
$\log \frac{(10°)''}{R''}$	9.242	9.242	9.242	9.242	9.242	9.242
	9.242	9.543	9.719	9.844	9.941	0.020
$\log e$	9.923	9.923	9.923	9.923	9.923	9.923
$\log \sin (M + n . 10°)$	9.782	9.866	9.925	9.965	9.989	0.000
	9.705	9.789	9.848	9.888	9.912	9.923

Therefore n is between 4 and 5. The lower sum of the vertical line 4 is greater than the upper sum by 44; on the line 5 it is less by 29; therefore $n = 4 + \frac{44}{44+29} = 4.6$. We have consequently

$E = 27^\circ\ 15' + 46^\circ = 73^\circ\ 15'$. Since $10n = 46$, I employ in the second case the equation (2) as follows:—

$\log 10n$	1·65321	1·66276	1·67210
$\log \frac{(1^\circ)''}{R''}$	8·24188	8·24188	8·24188
	9·89509	9·90464	9·91398
$\log e$	9·92315	9·92315	9·92315
$\log \sin (M + 10n \cdot 1^\circ)$	9·97882	9·98117	9·98338
	9·90197	9·90432	9·90653

Here $10n = 45 + \dfrac{688}{688+32} = 45{\cdot}956$; but $45^\circ{\cdot}956 = 45^\circ\ 57'\ 22''$. Therefore $E = 27^\circ\ 15'\ 7''{\cdot}4 + 45^\circ\ 57'\ 21''{\cdot}6$; or, $E = 73^\circ\ 12'\ 29''$, a value exact to within a few seconds.

The definitive correction ΔE, may be obtained from

$$\Delta E = \frac{M + e \sin E - E}{1 - e \cos E}.$$

Naples, Feb. 7, 1877.

Note on a Transformation of Lagrange's Equations of Motion in Generalised Coordinates, which is convenient in Physical Astronomy. By Robert S. Ball, LL.D., F.R.S., Royal Astronomer of Ireland.

I can hardly suppose that the following Note contains anything which has not already been published; but as I have not met with this transformation in my reading, nor conversed with anyone who is acquainted with it, I am led to believe that, even if it be not new, it is certainly not so well known as its convenience deserves.

Lagrange's Equations of Motion in Generalised Coordinates are not, in their usual form, particularly well adapted for Physical Astronomy. In a problem in Physical Astronomy, what we want to learn is the *relative* coordinates of a system, while its *absolute* situation in space does not concern us. Lagrange's equations, however, involve *both* the relative and the absolute coordinates, and we are obliged to remove the latter by elimination. It is the object of this Note to point out a very simple transformation of Lagrange's equations which obviates the inconvenience of having to perform the elimination. This advantage is gained without detracting from the simplicity and directness which render Lagrange's equations such exquisite instruments of analysis.